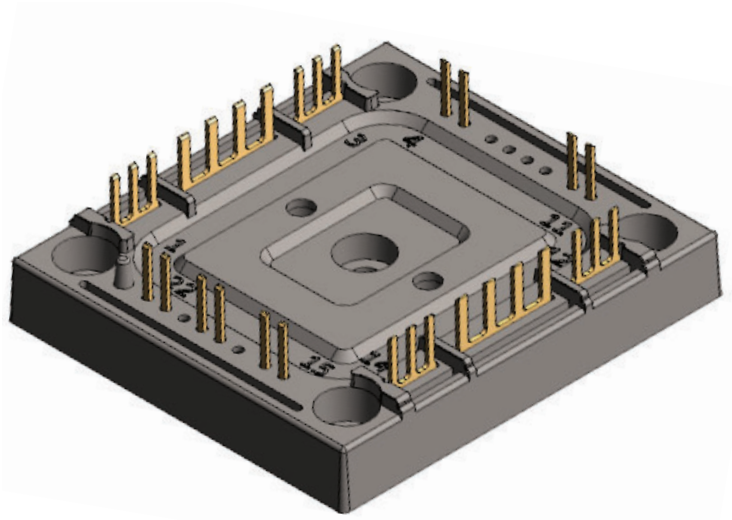
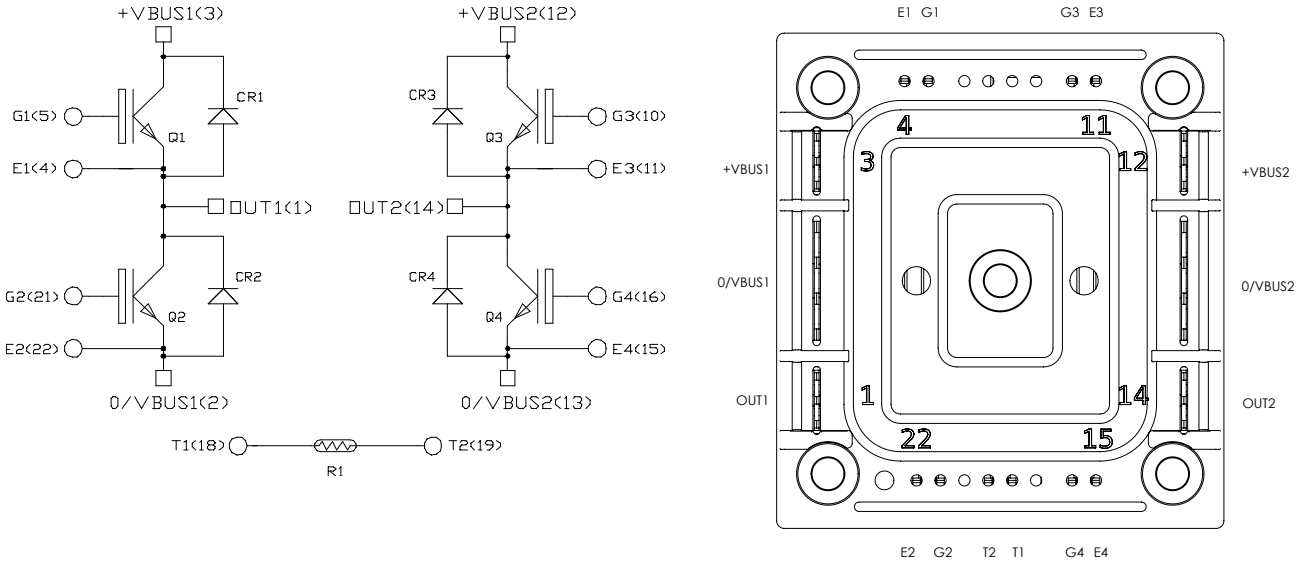
MSCGLQ75H120CTBL3NG

Full Bridge High-Speed IGBT4 Power Module

Product Overview

The MSCGLQ75H120CTBL3NG device is a 1200 V/75 A full bridge high-speed IGBT4 power module.





All ratings at T_J = 25 °C, unless otherwise specified.

Caution: These devices are sensitive to electrostatic discharge. Proper handling procedures must be followed.

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Features

The following are the key features of MSCGLQ75H120CTBL3NG device:

- High speed IGBT4
  - Low voltage drop
  - Low leakage current
  - Low switching losses
- SiC Schottky Diode
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature independent switching behavior
  - Positive temperature coefficient on V_F
- Very low stray inductance
- Ultra-low weight and profile
- Kelvin emitter for easy drive
- Si_3N_4 substrate with thick copper for improved thermal performance
- Internal thermistor for temperature monitoring
- Extended temperature range

Benefits

The following are the benefits of MSCGLQ75H120CTBL3NG device:

- High efficiency converter
- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction-to-heatsink thermal resistance
- Low profile
- RoHS compliant
- Solderable terminals both for power and signal for easy PCB mounting
- Very integrated power conversion system

Application

The following are the applications of MSCGLQ75H120CTBL3NG device:

- High reliability power systems
- AC switches

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1. Electrical Specifications

This section provides the electrical specifications of MSCGLQ75H120CTBL3NG device.

1.1 IGBT4 Characteristics (Per IGBT)

The following table lists the absolute maximum ratings of MSCGLQ75H120CTBL3NG device.

Table 1-1. Absolute Maximum Ratings

Symbol	Parameter		Maximum Ratings	Unit
V_{CES}	Collector-Emitter voltage		1200	V
I_C	Continuous collector current	T_H = 25 °C	160	A
		T_H = 100 °C	75	
I_{CM}	Pulsed collector current	T_H = 25 °C	250	
V_{GE}	Gate-Emitter voltage		±20	V
P_D	Power dissipation		470	W

The following table lists the electrical characteristics of MSCGLQ75H120CTBL3NG device.

Table 1-2. Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{CES}	Zero gate voltage collector current	V_{GE} = 0 V V_{CE} = 1200 V		—	—	50	µA
$V_{CE(sat)}$	Collector emitter saturation voltage	V_{GE} = 15 V I_C = 75 A	T_J = 25 °C	1.7	2.05	2.4	V
			T_J = 150 °C	—	2.6	—	
$V_{GE(th)}$	Gate threshold voltage	V_{GE} = V_{CE} I_C = 2.6 mA		5.3	5.8	6.3	V
I_{GES}	Gate-Emitter leakage current	V_{GE} = 20 V V_{CE} = 0 V		—	—	150	nA

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The following table lists the dynamic characteristics of MSCGLQ75H120CTBL3NG device.

Table 1-3. Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input capacitance	V_{GE} = 0 V V_{CE} = 25 V f = 1 MHz		—	4400	—	pF
C_{oes}	Output capacitance			—	250	—	
C_{res}	Reverse transfer capacitance			—	235	—	
Q_g	Gate charge	V_{GE} = 15 V V_{CE} = 960 V I_C = 75 A		—	325	—	nC
$T_{d(on)}$	Turn-on delay time	V_{GE} = ±15 V V_{Bus} = 600 V I_C = 75 A R_G = 6.4 Ω	T_J = 150 °C	—	30	—	ns
T_r	Rise time			—	49	—	
$T_{d(off)}$	Turn-off delay time			—	366	—	
T_f	Fall time				48	—	
E_{on}	Turn-on switching energy	V_{GE} = ±15 V V_{Bus} = 600 V I_C = 75 A R_G = 6.4 Ω	T_J = 150 °C	—	3.84	—	mJ
E_{off}	Turn-off switching energy		T_J = 150 °C	—	3.84	—	
R_G	Integrated gate resistor			—	10	—	Ω
I_{SC}	Short circuit data	V_{GE} ≤ 15 V V_{Bus} = 900 V t_p ≤ 10 µs	T_j = 150 °C	—	260		A
R_{thJH}	Junction-to-heatsink thermal resistance	λ_{paste} = 3.4 W/mK		—	0.318	—	°C/W

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1.2 SiC Diode Ratings and Characteristics (Per SiC Diode)

The following table lists the SiC diode ratings and characteristics of MSCGLQ75H120CTBL3NG device.

Table 1-4. SiC Diode Ratings and Characteristics (Per SiC Diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak repetitive reverse voltage			—	—	1200	V
I_{RM}	Reverse leakage current	V_R = 1200 V	T_J = 25 °C	—	10	200	µA
			T_J = 175 °C	—	250	—	
I_F	DC forward current		T_H = 100 °C	—	50	—	A
V_F	Diode forward voltage	I_F = 50 A	T_J = 25 °C	—	1.5	1.8	V
			T_J = 175 °C	—	2.1	—	
Q_C	Total capacitive charge	V_R = 600 V		—	224	—	nC
C	Total capacitance	f = 1 MHz, V_R = 400 V		—	246	—	pF
		f = 1 MHz, V_R = 800 V		—	182	—	
R_{thJH}	Junction-to-heatsink thermal resistance	λ_{paste} = 3.4 W/mK		—	0.635	—	°C/W

1.3 Thermal and Package Characteristics

The following table lists the thermal and package characteristics of MSCGLQ75H120CTBL3NG device.

Table 1-5. Thermal and Package Characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
V_{ISOL}	RMS isolation voltage, any terminal to case t = 1 min, 50 Hz/60 Hz			2500	—	—	V
T_J	Operating junction temperature range			–55	—	175	°C
T_{JOP}	Recommended junction temperature under switching conditions			–55	—	T_{Jmax}–25	
T_{STG}	Storage case temperature			–55	—	125	
T_C	Operating case temperature			–55	—	125	
Torque	Mounting torque	To heatsink	M3	0.7	—	0.9	N.m
Wt	Package weight			—	32.5	—	g

The following table lists the temperature sensor NTC of MSCGLQ75H120CTBL3NG device.

Table 1-6. Temperature Sensor NTC

Symbol	Characteristic		Min	Typ	Max	Unit
R_{25}	Resistance at 25 °C		—	50	—	kΩ
$\Delta R_{25}/R_{25}$	—		—	5	—	%
$B_{25/85}$	T_{25} = 298.15 K		—	3952	—	K
ΔB/B	—	T_C = 100°C	—	4	—	%

$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

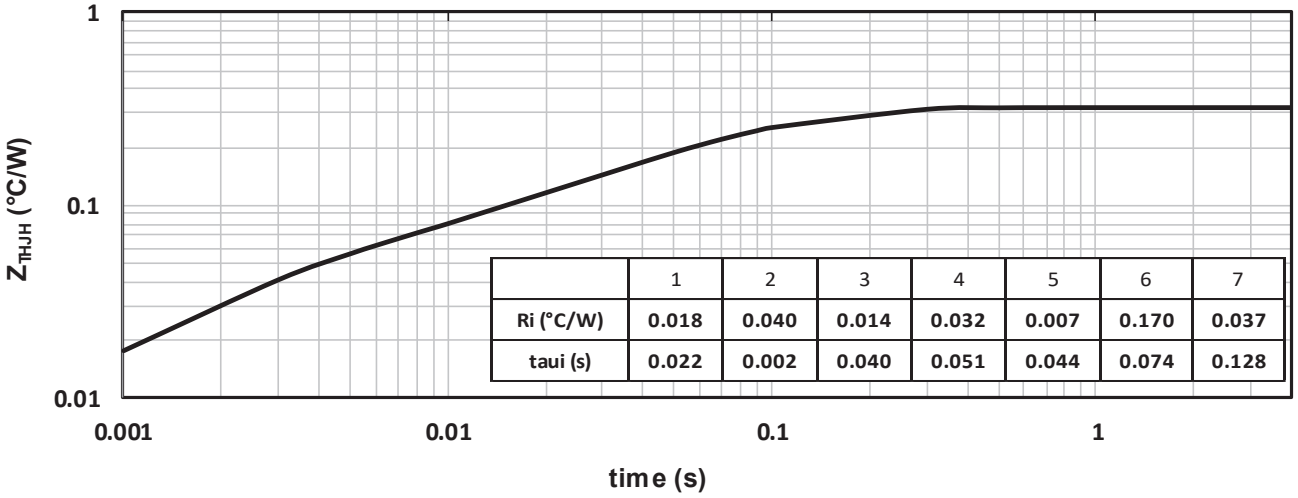
T: Thermistor temperature
R_T: Thermistor value at T

Note: See APT0406—Using NTC Temperature Sensor Integrated into Power Module for more information.

1.4 Typical IGBT4 Performance Curve (Per IGBT)

This section shows the typical IGBT4 performance curves of MSCGLQ75H120CTBL3NG device.

Figure 1-1. Junction-to-Heatsink Thermal Impedance



	1	2	3	4	5	6	7
Ri (°C/W)	0.018	0.040	0.014	0.032	0.007	0.170	0.037
taui (s)	0.022	0.002	0.040	0.051	0.044	0.074	0.128

Figure 1-2. Output Characteristics (V_{GE} = 15 V)

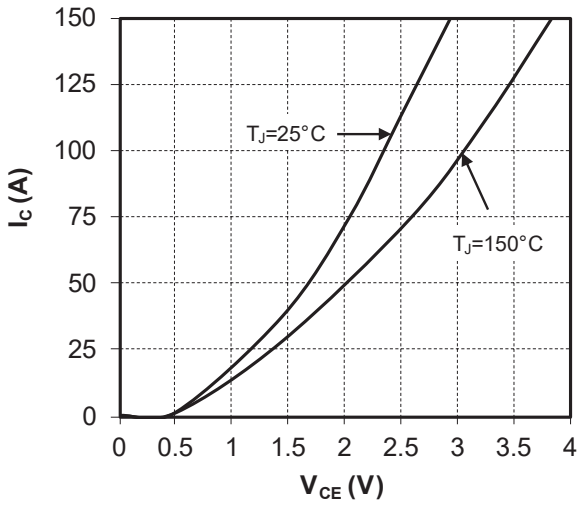


Figure 1-3. Output Characteristics

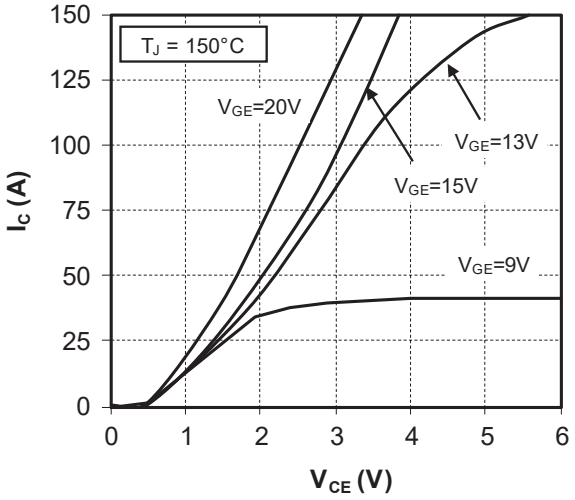


Figure 1-4. Transfer Characteristics

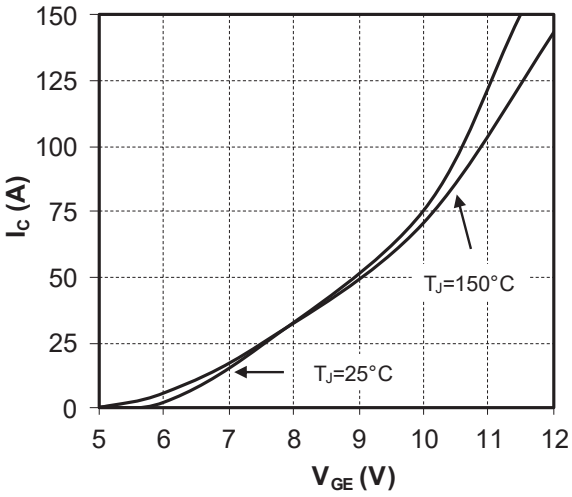


Figure 1-5. Energy losses vs. Collector Current

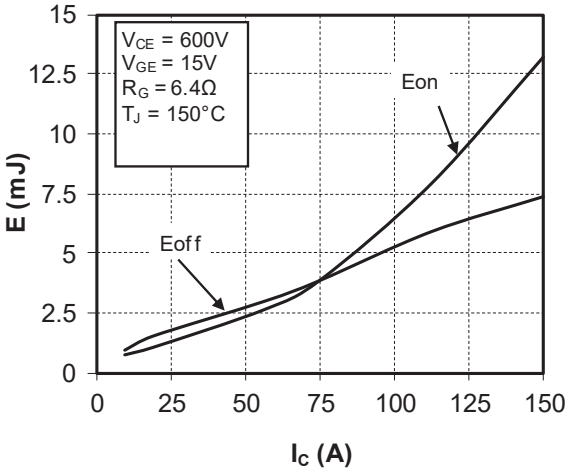


Figure 1-6. Switching Energy Losses vs. Gate Resistance

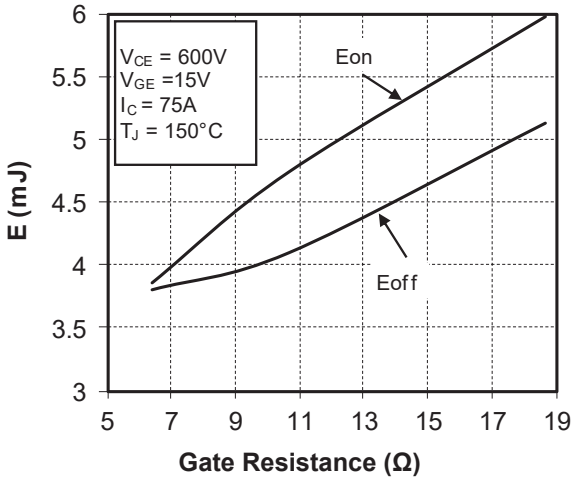
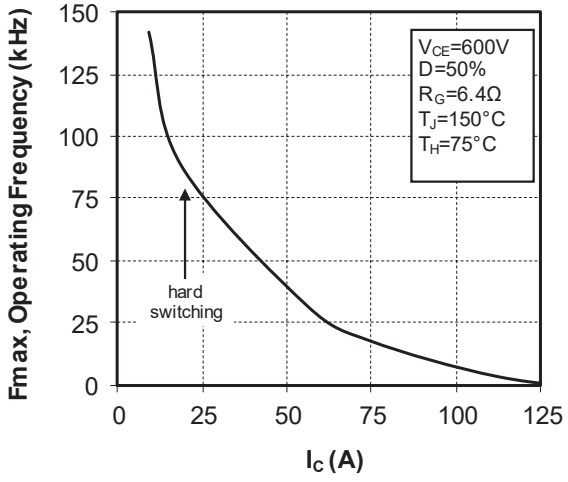


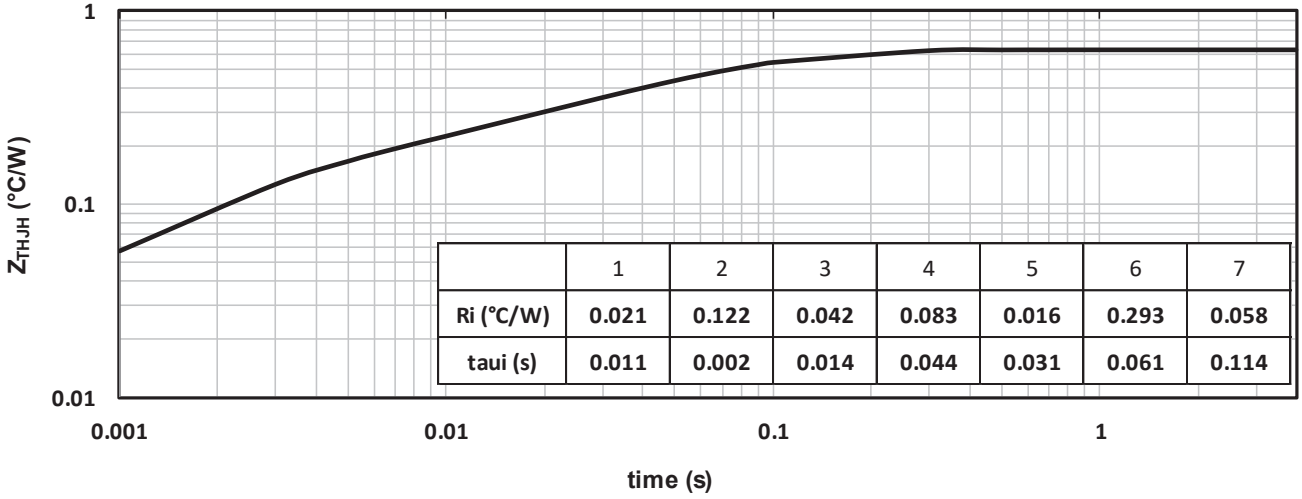
Figure 1-7. Operating Frequency vs. Collector Current



1.5 Typical SiC Diode Performance Curve (Per SiC Diode)

This section shows the typical SiC diode performance curves of MSCGLQ75H120CTBL3NG device.

Figure 1-8. Junction-to-Heatsink Thermal Impedance



	1	2	3	4	5	6	7
Ri (°C/W)	0.021	0.122	0.042	0.083	0.016	0.293	0.058
taui (s)	0.011	0.002	0.014	0.044	0.031	0.061	0.114

Figure 1-9. Forward Characteristics

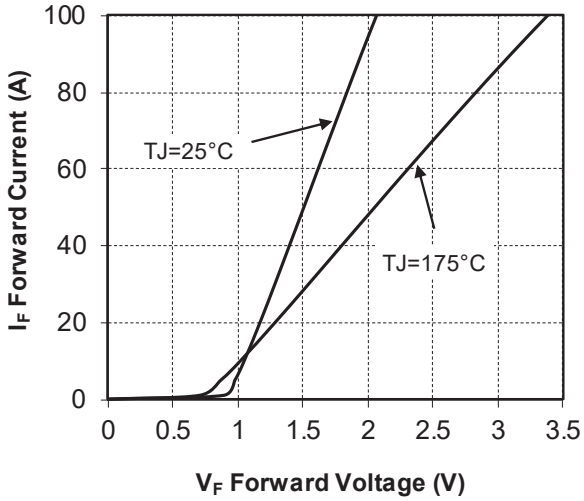
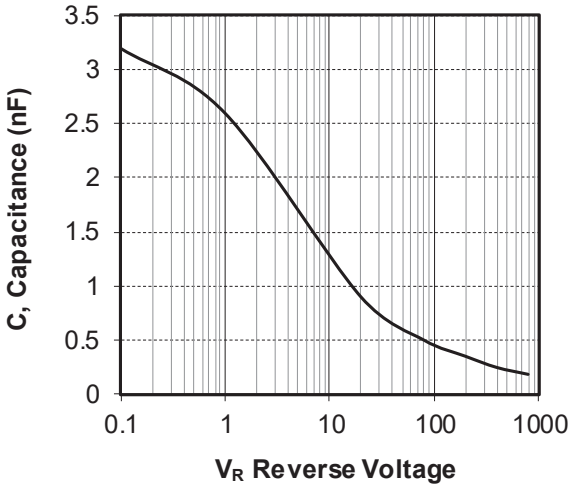


Figure 1-10. Capacitance vs. Reverse Voltage



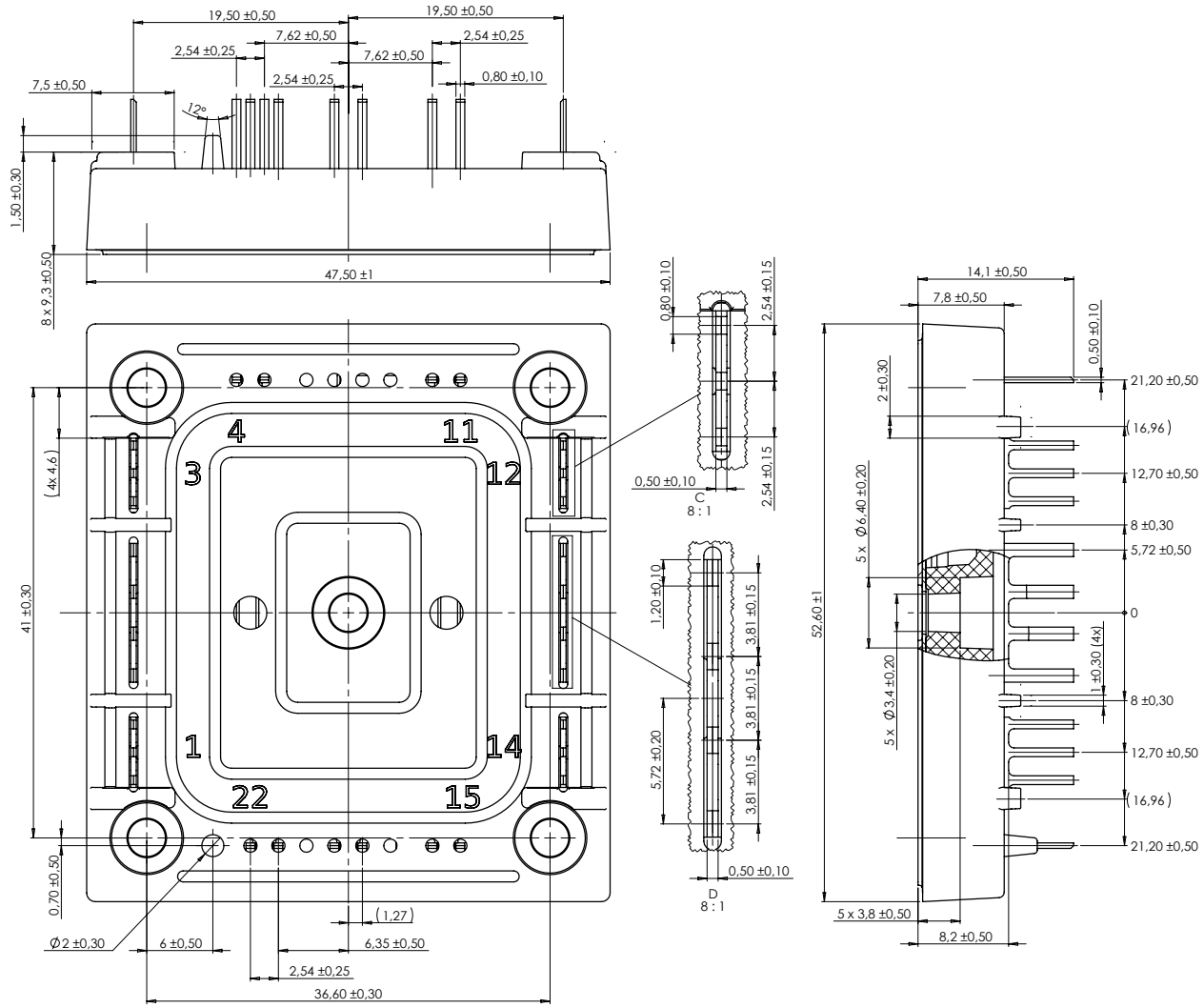
2. Package Specifications

The following section shows the package specification of MSCGLQ75H120CTBL3NG device.

2.1 Package Outline

The following figure shows the package outline drawing of MSCGLQ75H120CTBL3NG device. The dimensions in the following figure are in millimeters.

Figure 2-1. Package Outline Drawing



3. Revision History

Revision	Date	Description
A	07/2021	Initial revision

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